--Background Information--

**[0002]** Pipettes are instruments for transferring defined amounts of liquids from one container to another and are used in particular in laboratories. The dispensing of liquids by means of pipettes is often the first step in a series of analytical experiments. Multi-channel pipettes are particularly efficient to work with, because they allow liquid to be aspirated simultaneously from one or more containers and to be dispensed into several receptacles at once. It is of particular importance that the volume of liquid taken in and dispensed to other containers is the same in all channels. In view of the strict requirements on the accuracy of the transferred volume, pipettes used for the foregoing purpose, especially multi-channel pipettes, have to be tested several times in the course of a year. In addition, verification tests of pipettes are required under official guidelines and international standards. A verification test is often referred to as a calibration.

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--SUMMARY OF THE INVENTION--

**[0006]** The present invention therefore has the objective of providing an apparatus for the gravimetric calibration of multi-channel pipettes with a transport device that advances the receptacles to the measuring device. The apparatus should have an uncomplicated design that causes no loss of precision of the calibration measurements, can be realized at a favorable cost, and has a faster operating speed, so that a multi-channel pipette can be calibrated in a reasonable amount of time.

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**[0007]** An apparatus for the gravimetric calibration of multi-channel pipettes according to the present invention contains a balance that has a load receiver configured to support receptacles containing a substance to be weighed. The apparatus has a holder device to support a certain number of the receptacles into which a test liquid is dispensed from the multi-channel pipette. The apparatus further has a transport device for advancing the holder device towards the load receiver. The receptacles are seated in the holder device at equally spaced positions with a defined distance from each other. The transport device has means whereby one after another of the receptacles can be delivered to and subsequently removed from the measuring device.

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**[0023]** In the attached drawing:

**[0024]** Fig. 1 represents an overall view of an exemplary transport device according to the invention;

**[0025]** Fig. 2 represents an exemplary embodiment of a holder device for receptacles in a perspective view;

**[0026]** Fig. 3 represents a top view of four different exemplary embodiments of receptacles A through D with their suspension members;

**[0027]** Fig. 4 represents a perspective view of an exemplary alternative design of the suspension members, particularly suitable for narrow receptacles;

**[0028]** Fig. 5 represents a perspective view of an exemplary transport rack and transport container, shown spatially separated from each other;

**[0029]** Fig. 6 represents a sectional view of an exemplary embodiment of a load receiver inside the holder device with a receptacle in place;

**[0030]** Fig. 7 represents an exemplary embodiment of the drive mechanism at a lowest position of a transport movement;

**[0031]** Fig. 8 illustrates in a detail view from the side an exemplary manner by which an exemplary transport device and load receiver work together;

**[0032]** Fig. 9 represents a cross-sectional view of an exemplary holder device;

**[0033]** Fig. 10 represents an exemplary integrated code reader arrangement near the load receiver, with code markings attached to the bottoms of the receptacles; and

**[0034]** Fig. 11 represents a perspective view of an exemplary transport device with a bar code marking on the holder device and a bar code reader mounted on the transport device.

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DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

**[0035]** An apparatus for the gravimetric calibration of multi-channel pipettes includes an electronic balance with a load receiver, a holder device, and a transport device for receptacles. Fig. 1 illustrates a transport device 1 with a housing 2, and a transport channel 5 running along the center of the housing 2. Transport racks 7 run near the top of the inward-facing side walls 3 of the channel 5. The bottom side 4 of each transport rack has a profile resembling a sine wave with truncated wave tops. The sine-wave profile could for example be formed as a machined recess in each side wall 3, in which case the

latter would be made of a thicker material. Alternatively, the sine-wave profile could be part of a rail that is set into the side wall 3. The transport rack 7 is delimited at the top by an upper rack profile 6 in the shape of arches, with the highest points of the arches lying opposite the truncated wave tops of the bottom side 4. A transport carriage 8 is movable in the transport channel, guided by the transport racks 7, as will be described in more detail in the context of Fig. 5. A holder device 10, which could also be called a holding frame, has a foot portion 11 that is seated with a snug fit in a seat 12, e.g. a cut-out, of the transport carriage 8. No additional fastener device is needed to keep the holder device 10 positioned on the transport carriage 8. A cover 9 is set over the holder device 10.

**[0036]** Fig. 2 gives a perspective view, looking from above at an oblique angle at the holder device 10 with the receptacles 13 for the test medium (usually water). In addition, Fig. 2 also shows the cover 9, likewise in perspective, looking at the underside of the cover 9. The holder device 10 includes an oblong T-shaped arrangement of three major parts. The side walls 14 extend from the foot portion 11 almost to the upper edge of the holder device 10. Tubs 15 are arranged on the outside of both side walls 14. The tubs 15 are filled with the same liquid as is used to test the pipettes (normally water), or they contain water-saturated sponges. Their purpose is to saturate the air inside the holder device 10 with humidity to counteract the evaporation of the test liquid in the receptacles 13. A humidity sensor installed close to the tubs 15 may be used to verify the degree of saturation. The side walls 14 have serrated upper rims forming a holder rack 16. The tips 17 and triangular indentations 18 in the rim of one side wall 14 are symmetrically aligned with the tips and indentations of the other side wall 14. The indentations of the holder rack